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EDITORIAL

PURE WATER

MAN is born to thrive, with pure air to breathe, pure water to drink and pure soil to live on. The impurities which render water and soil unfavorable to his own development are the products of his own life—and their removal his own responsibility."

This quotation, of unknown authorship, came to mind while contemplating the results of an analysis of the waters of one of the two large rivers, (the Schuylkill) supplying the aqueous needs of Philadelphia's urban population.

Approximately one ounce of sludge and slime and solubles was contained in a gallon of this unfiltered water, which however when delivered to the household and the factory, thanks to the chemists and engineers, is relatively safe to drink—satisfactory for most industrial uses—containing less than 5 grains of harmless solids to the gallon.

Yet while admitting the splendid supervision and protection which the municipal water engineers and chemists give their employers—the citizens of Philadelphia (each with a daily per capita consumption of 168 gallons of treated water!) it is unbelievable that such arrant pollution of water sources should be tolerated in any community.

Listen to this recital of the industrial wastes that find their way to Schuylkill's waters.

First, there are the animal materials such as those from stockyards and abattoirs, packing plants, tanneries, woolen industries; second, wastes of vegetable origin such as those from cotton, paper mills, and rubber factories; third, wastes of mineral origin such as those from dye and gas plants, coal mines, chemical plants, bleacheries, etc. Gloriously enough the raw water of the Schuylkill is polluted by all

three types of industrial wastes. And that makes *Aqua Schuylkilliensis* or any other aqua a pretty strong drink.

No one in his senses would ever deny that the raw water as it comes into the intakes from the two Philadelphia rivers is anything but a compound infusion of slime and sickly sewage, totally unfit for human consumption.

Modern civilization laughs at the primitive practices of cannibals and savages, who bathe their bodies and wash their clothes in their village drinking ponds. But the pollution of Philadelphia's water sources is much more savage and reeks with more filth than ever did the uncivilized and primitive combination of swimming pools and drinking fountains.

Furthermore the watersheds of the Delaware and Schuylkill carry a population of nearly a million and a half, and these two creeks bring to Philadelphia every day on their way to the sea the sewage and industrial pollutions of this whole contiguous community of a million and a half people. Recall, too, that every normal adult, excretes about five billion *B. coli* every day. No wonder our creeks are dirty.

Nor must we forget that after the Philadelphia engineers temporarily remove the muck and slime from this raw water, they return it, as sedimented sludge and slime, from the laundered sand filters back to the rivers again—and along with it the excreta, biologic and industrial, of another two million parasites and with their compliments to Chester, Wilmington and the deep blue sea. But that is another story.

Where there is no water, there is no life. No matter whether life elects to serve its time in the simple single-celled amoeba, or in the trillion-celled, complicated and conceited creature called man—short indeed would be its stay unless it has the varied services of its versatile ambassador—water. Life comes to us wrapped up in water, and death, so often the solution of all our problems, is also always a water reaction. Indeed, water gets us even after death, for it is largely through its agency that Nature uses our substance over again in the fabrication of other creatures which are generally improvements over the originals.

In the animal body, water serves in manifold ways, and every tissue has its share of fluid. No physiologic action could take place without it and every tissue in the body needs its share as indicated by the following table:

Blood	70%	Brain and nerves	70-77%
Muscles	75%	Hair	5%
Fat	8%	Nails	5%
Bones	14-44%		

Solvent, cleanser, purging agent, vehicle of the vital forces, regulator of body heat, lubricant, these are but a few of water's biologic functions.

Yet in spite of this obvious biologic importance of clean, natural water, we tolerate a needless pollution of our sources and a much needed, though *damaging* chemicalization of this tainted material to make it safe for democracy—and the few stalwart republicans left.

Anyone knows that a truly *potable* natural water is far kinder to our systems than any *purified* or *chemicalized* dirty or polluted water.

Listen—there is a *biologic something* in clean natural waters—an undefined, elusive something that has escaped the attention of the sanitarian scientists of this day and generation—and which must be injured in the several heroic processes of large scale purification.

The foregoing is an empiric statement which, if noted, would only invite a laugh from some of our modern, armadillo-minded magisters of science.

But the writer ventures the prediction that this *something* will some day and some day soon, be made as tangible and real as have the vitamins, which for generations were empirically well known to the laity and yet sneered at by many a crop of one-eyed and addle-headed theorists before their eventual discovery.

Of course—it is admissible that pure natural waters are no longer available for the vast array of consumers in the congested areas—but it is equally admissible that *the pollution of our water sources can and should be held down to a minimum, so that by the same token, chemicalization can be equally minimized.*

And it is little wonder that the new Pharmacopœia, recognizing the hazards of ordinary water for the making of medicines, will give official sanction only to "Aqua Destillata."

IVOR GRIFFITH.

ORIGINAL ARTICLES

THE SEPARATION AND DETECTION OF COCAINE IN MIXTURES OF COCAINE AND PROCAINE*

By Charles H. Riley

IN a mixture of cocaine ($C_{17}H_{21}NO_4$) and procaine ($NH_2C_6H_4\cdot CO\cdot OC_2H_4N(C_2H_5)_2$), the detection and positive identification of the cocaine is difficult if procaine is present in large amounts.

The addition of platinic chloride solution (H_2PtCl_6) to a solution of pure cocaine, results in the formation of feathery crystals which are characteristic for cocaine, and may be observed under the microscope. Since procaine, if present in large amounts, prevents the formation or alters the shape of these crystals, a method of separating cocaine in a pure form from the mixture was desired, after which the cocaine could be positively identified by the formation of characteristic crystals with H_2PtCl_6 or other suitable alkaloid precipitants.†

Three methods of separation were worked out, and these are based on the fact that the pH can be so adjusted that cocaine hydrochloride is converted to the free base, whereas procaine hydrochloride remains unchanged. The cocaine free base is then separated from the procaine hydrochloride by extraction with chloroform (Method I).

Further investigation revealed that a better separation and detection of smaller amounts of cocaine could be obtained by reversing the procedure. In this method (which is slightly longer than Method I) the procaine and cocaine salts are dissolved in water, converted to the free base by adding disodium phosphate, and both substances are extracted with chloroform. The chloroform containing dissolved procaine and cocaine is then shaken with a buffer solution, which converts most of the procaine to a water soluble salt and leaves the cocaine unchanged in the chloroform layer. The small amount of procaine free base remaining in the chloroform is then removed by shaking the chloroform with a second portion of the buffer solution. Methods II and III are based on this procedure.

*Contribution from the New York Branch Laboratory of the Alcohol Tax Unit, Bureau of Internal Revenue.

†"Microchemical Tests for Alkaloids," Stephenson (Lippincott, 1921). C. C. Fulton, *Am. Jour. Pharm.* 105, 326-39, 374-80 (1933).

Method I is the most rapid, but is suitable only when the procaine and cocaine are present as water soluble salts. This method will detect as little as one milligram of cocaine hydrochloride in 200 mg. of procaine hydrochloride (0.5 per cent.) The amount of cocaine free base extracted by Method I is not an indication of the quantity of cocaine hydrochloride in the sample.

Method II, which is somewhat longer but more sensitive than Method I, furnishes an indication of the quantity of cocaine in the mixture, and can be used for either the free base or salt. As indicated by Table II, this method is suitable for detecting 0.4 mg. of cocaine hydrochloride in the presence of 200 mg. of procaine hydrochloride (0.2 per cent.), or 0.5 mg. of cocaine hydrochloride in the presence of 1 gram of procaine hydrochloride (0.05 per cent.). Over 80 per cent. of the cocaine is extracted, provided the amount of cocaine hydrochloride present in the sample is not over 75 mg. When 10 or more milligrams of cocaine hydrochloride are present in 200 mg. of procaine hydrochloride, sufficient cocaine-free base is extracted to be identified by a melting point. No procaine is extracted by Method II. The cocaine was detected in the chloroform residue by the formation of characteristic unmodified cocaine crystals with platinic chloride solution. Gold chloride also gave characteristic crystals and is even more sensitive, but traces of impurities occluded in the chloroform extract tend to modify or prevent the formation of crystals with gold chloride, whereas this condition is not observed with H_2PtCl_6 .

After the above qualitative methods were completed, an attempt was made to determine the amount of cocaine quantitatively by completely separating it from the procaine and then titrating the pure cocaine free base with standard acid. An ideal separation was not obtained, as Table III for Method III will show. However, when a 200-250 mg. sample is taken, not more than 4 mg. of cocaine remain unextracted from the buffer solution, and not more than 4 mg. of procaine are extracted with the cocaine-free base. Thus the trace of unextracted cocaine is compensated for, by the presence of a trace of procaine present as impurity in the cocaine extract. This trace of procaine would prevent the detection of traces of cocaine by Method III; however, this method is not intended for use in detecting traces of cocaine, but is suitable for use in estimating within 4 mg. the amount of cocaine (if an appreciable quantity is present) in the mixture. In most instances, the error is less than 4 mg. The presence of stopcock

grease on the separatory funnels used should be avoided and entirely dispensed with, if possible. All the results herein described were obtained with stopcock grease entirely absent.

The success of these three methods depends entirely upon the use of buffer solutions of the proper hydrogen ion concentration. The buffer solutions used were prepared by mixing 0.5 m. citric acid and 0.5 m. secondary sodium phosphate (Na_2HPO_4) in the proper proportions. Before use, the 0.5 m. acid and base must be checked against standardized base and acid respectively. Any other buffer mixture of approximately the same total concentration and of the same pH as the three buffers herein described should give the same results.

Preparation of Standard Solutions

0.5 Molar Citric Acid Solution

Dissolve 21 grams of C. P. citric acid ($H_3C_6H_5O_7 + H_2O$) in 150 cc. of distilled water, add 1 cc. of chloroform to prevent mold formation, and make up to a volume of 200 cc. with distilled water. One cubic centimeter of this solution should require 15 cc. of 0.1 N. for neutralization using phenolphthalein as indicator.

0.5 Molar Secondary Sodium Phosphate (Na_2HPO_4)

Weigh accurately 14.2 grams of C. P. anhydrous secondary sodium phosphate which has been dried for one hour at 110° C. Dissolve the 14.2 grams in 150 cc. of distilled water and make up to a volume of 200 cc. Five cubic centimeters of this solution should require 25 cc. of 0.1 N. sulphuric acid for neutralization using methyl orange as indicator.

Method I

Rapid Method of Separation and Identification of Cocaine Hydrochloride in a Mixture of Cocaine Hydrochloride and Procaine Hydrochloride (Novocaine)

Prepare buffer No. 1 (pH 3.6) by mixing 5 cc. of 0.5 m. citric acid solution and 5 cc. of 0.5 m. secondary sodium phosphate (Na_2HPO_4) solution. Dissolve the procaine hydrochloride suspected of containing cocaine hydrochloride in 5 cc. of water. Pour the solution into a small separatory funnel (100-200 cc. capacity) and add 10 cc. of buffer No. 1. Thoroughly mix the two solutions and then add 10 cc. of chloroform. Shake the mixture thoroughly for several minutes and then allow the chloroform layer to separate. Insert a plug

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TABLE I
DETECTION OF COCAINE HCl IN THE PRESENCE OF PROCAINE HCl BY METHOD I

Procaine HCl Weight in m.g.	Cocaine HCl Weight in m.g.	% Cocaine HCl in Mixture	c.c. of Buffer No. 1	c.c. of Chlorform Used for Extraction	Solid Residue from CHCl_3 Extraction			Detection of Cocaine HCl.		
					CHCl ₃ Washed c.c. H_2O	Weight in m.g.	Drops Dilute HCl Added	Crystals with H_2PtCl_6 Soln.	Satisfactory	Unsatisfactory
					c.c. Total Volume	10-5	2			
200	10	5%	10	15	10-5	5	3	—	✓	
200	2	1%	10	15	10-5	5	<1	2	—	✓
200	1	0.5%	10	15	10-5	5	<1	1	+	✓
1000	1	0.1%	10	15	10-5	5	<1	1	+	✓
200	0	0%	10	15	10-5	5	<0.5	2	—	✓
Free Base 200	0	0%	10	15	10-5	5	1.5	2	—	✓
								On standing		Mayers Faint Pos.

of cotton in the stem of the separatory funnel, and draw off the chloroform into a second separatory funnel which contains 5 cc. of distilled water. Shake the contents of separatory funnel No. 2 thoroughly, allow the chloroform layer to separate, and place a plug of cotton in the separatory funnel stem. Draw off the chloroform layer into a small glass evaporating dish. Repeat the extraction of the buffered solution, using 5 cc. of chloroform, and wash the chloroform layer with the distilled water in funnel No. 2. Evaporate the combined chloroform solutions to dryness on a water bath; then cool and add two drops of approximately two normal hydrochloride to the residue. Decant the hydrochloride containing any dissolved residue onto a microscope slide, and add one drop of 8 per cent. platinic chloride solution (H_2PtCl_6) to the center of the liquid. Examine under the microscope for characteristic cocaine crystals.

Ten cc. of 0.5 m. KH_2PO_4 may be substituted for buffer No. 1. Since KH_2PO_4 is slightly less acidic than buffer No. 1, a small amount of procaine free base is extracted, but it will not interfere with the formation of characteristic cocaine crystals.

Method II

Detection of Small Amounts of Cocaine in a Mixture of Cocaine and Procaine

Prepare buffer No. 2 (pH 4.7) by mixing 50 cc. of 0.5 m. citric acid and 90 cc. of 0.5 m. Na_2HPO_4 . Four small separatory funnels (100-200 cc. capacity) free from stopcock grease, are required. To separator No. 1 add 200-250 mg. of the procaine hydrochloride suspected of containing cocaine hydrochloride. Dissolve the sample in 15 cc. of water and add 0.5 cc. of 0.5 m. Na_2HPO_4 and 15 cc. of $CHCl_3$ to separatory funnel No. 1. Shake the mixture for one minute and then allow the chloroform layer to separate.

Place 15 cc. of buffer No. 2 in separatory funnel No. 2, 10 cc. of buffer No. 2 in separatory funnel No. 3, and 5 cc. of distilled water in separatory funnel No. 4. Place a plug of cotton in the stem of separatory funnels No. 3 and No. 4. Now draw off the chloroform layer from separatory funnel No. 1 into separatory funnel No. 2 and shake the contents. When the chloroform layer separates, drain it from separatory funnel No. 2 to No. 3 and shake the contents of separatory funnel No. 3 to convert any small quantity of procaine free base remaining in the chloroform to its water soluble salt, and

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TABLE II
DETECTION OF COCAINE HCl IN THE PRESENCE OF PROCAINE HCl BY METHOD IIBuffer No. II—pH—4.7
c.c. 0.5 m. Citric Acid—50
c.c. 0.5 m. Na_2HPO_4 —90

Procaine HCl Weight in m.g.	Cocaine HCl Weight in m.g.	Separatory Funnel				c.c. CHCl ₃ used for Extraction	Weight of CHCl ₃ Residue in m.g.	No. Drops HCl Added to Residue	Crystals Cocaine with H ₂ PtCl ₆ Solution	Crystals Procaine with H ₂ PtCl ₆ Solution	Detection of Cocaine HCl Satisfactory	Detection of Cocaine HCl Unsatisfactory	Molting Point of CHCl ₃ Residue
		No. 1	No. 2	No. 3	No. 4								
200	10	5.0%	0.5	15	15	10	5	15-10	8		—	✓	97°C
200	1	0.5%	0.5	15	15	10	5	15-10	≤1	2	Very heavy	—	
200	0.4	0.2%	0.5	15	15	10	5	15-10	≤1	2	+	—	
200	0.2	0.1%	0.5	15	15	10	5	15-10	≤1	2	Few	—	
1000	0.5	0.05%	0.5	15	15	10	5	15-10	≤1	2	Heavy	—	
Free Base										2	+	✓	
200	0.4	0.2%	—	—	15	10	5	15-10	≤1	2	+	—	
200	0	0%	—	—	15	10	5	15-10	≤0.5	2	—	—	
HCl	200	0	0%	0.5	15	10	5	15-10	Trace	2	—	—	

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thus remove it from the chloroform. Draw off the chloroform from separatory funnel No. 3, through the cotton plug in the stem, into separatory funnel No. 4. Shake the contents to wash the chloroform and after the solution has separated, draw off the chloroform through the cotton plug in the stem into an evaporating dish. Repeat the extraction through all four separators, using 10 cc. of chloroform where 15 cc. were used for the first extraction.

Since the cotton plugs usually absorb and hold back a small amount of CHCl_3 which may contain cocaine, it is advisable to add 1-2 cc. of CHCl_3 to separators No. 3 and No. 4 after each CHCl_3 extract has been drawn off. This 1-2 cc. of chloroform will immediately settle to the bottom of the separator, from which it can be drawn off and combined with the CHCl_3 previously removed. Evaporate the two combined CHCl_3 solutions on the water bath. Remove and cool the evaporating dish. If the residue is large (over 10 mg.), cocaine will usually crystallize as the free base on standing overnight. The cocaine will usually crystallize in 15 minutes if 2-3 drops of water are added to the evaporating dish, to wash the surface of the solid amorphous residue, and then decanted. If the residue is large, place a small quantity on a microscope slide, dissolve it with 1-2 drops 2 N HCl, and add one drop of 8 per cent. H_2PtCl_6 solution. Examine the slide under the microscope for characteristic feathery cocaine crystals. If the residue from the CHCl_3 extraction is small, add two drops of approximately 2 N HCl directly to the evaporating dish and rotate the dish to bring the acid in contact with all of the residue. Decant one drop onto a microscope slide, add one drop of 8 per cent. H_2PtCl_6 solution to the slide and examine under the microscope for cocaine crystals. If any stopcock grease was extracted by the chloroform, it may prevent the acid from coming in contact with the cocaine free base. When grease is present in the residue add two drops of approximately 2 N HCl and 2 cc. of CHCl_3 , stir the mixture and then evaporate the chloroform. Decant the acid onto a microscope slide and test for cocaine. Glass evaporating dishes were found most convenient for observing small residues.

If the procaine suspected of containing cocaine is in the form of the free base, dissolve 200 mg. of sample in 15 cc. of CHCl_3 , omit separator No. 1, and add the chloroform containing the free base directly to separator No. 2.

Method III

Separation and Estimation of the Amount of Cocaine Present in a Mixture of Cocaine and Procaine

Prepare buffer No. 3 (pH 4.9) by mixing 10 cc. of 0.5 molar citric acid and 20 cc. of 0.5 molar Na_2HPO_4 . Add 200-250 mg. of the mixture of cocaine HCl and procaine HCl to separatory funnel No. 1 and dissolve it in 12 cc. of water. Then add 3 cc. of 0.5 m. Na_2HPO_4 to separatory funnel No. 1. To separatory funnel No. 2, add 15 cc. of buffer No. 3. To separatory funnel No. 3, add 10 cc. of buffer No. 3. To separatory funnel No. 4, add 5 cc. distilled water. Place a plug of cotton in the stems of separatory funnels No. 3 and No. 4.

Proceed as in Method II, making three extractions with CHCl_3 using 15-10-10 cc. Avoid the loss of any CHCl_3 . Evaporate the CHCl_3 in a weighed evaporating dish, dry and weigh the residue. To titrate the cocaine, add a few cubic centimeters of neutral alcohol and warm to dissolve the residue, then add 20 cc. of 0.5 N H_2SO_4 and titrate the excess of 0.5 N H_2SO_4 with 0.02 N NaOH using methyl red as indicator. One cc. 0.5 N H_2SO_4 = 0.015158 gram cocaine. One cc. 0.5 N H_2SO_4 = 0.01698 gram cocaine HCl.

If the cocaine-procaine mixture is in the form of the free base, dissolve 200 mg. in 15 cc. of CHCl_3 and proceed as in Method III, omitting separator No. 1.

Summary

1. Two methods are given for the separation and identification of small quantities of cocaine HCl when a large amount of procaine HCl is present.
2. One method is given for the detection of small quantities of cocaine free base when a large amount of procaine free base is present.
3. One method is given which is suitable for estimating within 4 mg. the amount of cocaine or cocaine HCl present in a mixture of procaine free base or salt and cocaine free base or salt.
4. Methods I and II separate cocaine in pure form uncontaminated with procaine.
5. Method III separates all but about 4 mg. of the cocaine from the mixture but the cocaine separated may contain as much as 4 mg. of procaine.
6. All of these methods are based on the fact that a buffer of

TABLE III
DETERMINATION OF QUANTITY OF COCAINE OR COCAINE HCl PRESENT IN A MIXTURE OF
COCAINE AND PROCAINE BY METHOD III

Procaine	Cocaine		Separatory Funnel		CHCl ₃ Extract after Evaporation of Chloroform		Procaine in Separators Nos. 1, 2, 3, 4, Extracted from NH ₄ OH Soda with CHCl ₃ and Calc. or weighed as:		Percent Cocaine in Original Sample		Error in Percent		
	Weight in m.g. as: Sample	% in Sample	Free Base HCl	No. 1	c.c. No. 3	c.c. No. 4	Titrated and Calculated as:	Free Base HCl	m.g. Free Base HCl	Calen- lated m.g. HCl	Found.		
Weight in m.g. as: Sample	Weight in m.g. as: Sample	% in Sample	Free Base HCl	No. 1	c.c. No. 3	c.c. No. 4	Titrated and Calculated as:	Free Base HCl	m.g. Free Base HCl	Calen- lated m.g. HCl	Found.	Error in Percent	
Procaine HCl													
Free Base													
225	100	100	187	100	15	10	5	15-10-10	184	186	-3	-1.6	
225	100	100	187	100	3	15	10	5	15-10-10	<3			
42	22.23	147	77.77		15	10	5	15-10-10	144	144	-3	-1.57	
128	58.2	92	41.8		15	10	5	15-10-10	92	90	-2	-1.57	
191	90.95	19	9.05		15	10	5	15-10-10	20	22	+3	+0.9	
114	53.3	100	46.7		15	10	5	15-10-10	99	101	+1	+0.5	
200	100				15	10	5	15-10-10	2		197		
225	90				10	3	15	10	21	23.5	+1	+0.4	
25	10				225	90	3	15	10	200	224	-4	-1.6

proper acidity will cause the formation of a water soluble salt of procaine and will not affect cocaine.

7. All methods given separate the cocaine as the free base and do not affect its molecular structure, thus permitting the identification of pure cocaine and not its decomposition products.

* * *

(The author wishes to express his appreciation for the facilities placed at his disposal by Mr. Geo. W. Romig, Jr., Chemist-in-Charge of the New York Laboratory, and for the many helpful suggestions given by Mr. Casimiro Liotta of this Laboratory.)

SKIN-ABSORBED VITAMINS—"Drinking" sunshine out of a bottle or eating it in foods by way of the sunshine vitamin—vitamin D—has been made possible by fairly recent developments in the science of nutrition, but now this is superseded by a still farther advance which makes it possible to rub such "sunshine" in through the skin. Confirmation has now been secured that if a substance containing vitamin D is applied to the skin, the vitamin factor passes through and supplies the deficiency of this vitamin in the diet.

Experiments thus far have been confined to animals, as has all previous experimental work in nutrition. The most recent experiments made by Dr. P. S. Astrow and Dr. R. A. Morgan are reported in the last issue of *The American Journal of the Diseases of Children*. They applied viosterol, an oil containing vitamin D to the tails of rats which were fed on a diet that would cause rickets. The rats did not get rickets. A control group fed on the same diet had applied to their tails an oil that did not contain vitamin D. These rats did develop rickets.

Getting the vitamin into the body through the skin from oils is not a very efficient method. In order to get the same effect as one dose administered through the mouth it was necessary to apply an amount of the vitamin sufficient for forty-five doses to the skin. However the research does support the contention that the body can absorb *sun-values* through the skin.

THE DRUGS OF THE BIBLE*

By John E. Kramer

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WITH your kind permission, this evening's story will start with the old favorite introduction, "Once upon a time." Not that this is a fairy tale, or, despite the hour, a bedtime story, but we wish

to indicate uncertainty as to exact dates. Therefore, once upon a time, perhaps 33 centuries ago, a number of Hebrew clans, headed by a leader named Moses, broke away from captivity and oppression in the land of Egypt. They settled in Palestine, and were forced into monarchial organization by cruel attacks from so-called neighbors on all sides. But even in those days, despite these fierce attacks which should have caused great consolidation of the clans, internal jealousies split the newly-

formed monarchy into two parts. Proving the "United we stand, divided we fall" maxim many years before it was originated, one part was captured, within a short time, historically speaking, by the stronger enemies, and most of the inhabitants exported. The other section resisted longer, but was finally overcome and driven out by a very strong country which had even defeated the first conquerors of the weaker half of the Hebrew monarchy. The entire affair was a sort of dog-eat-dog series of episodes.

But the Babylonians, who were the conquerors of all, feeling secure in their position, relaxed their strict vigilance and many Jews returned to their beloved Jerusalem, temples were rebuilt and true Judaism came into being. Wars and oppression still followed the race, however, culminating finally in its complete subjection to the Romans.

Despite these hardships and adversities, the Jews retained their religious unity, giving rise to much religious literature, telling of the history and beliefs of the race through approximately thirteen centuries. The Old Testament of the Bible is a collection of this literature.

*The fourth of the 1935 Popular Science Lecture series delivered by members of the College Faculty.

During the Roman domination came the birth of Jesus, his life, and his death at the age of thirty. Jesus' life had a great influence on His followers, and such was their faith in Him that they could not believe, when He died, that He could possibly stay away more than a very short time. For that reason, awaiting His early return, His disciples did not bother to write about or record in any detail the great events that transpired during His stay on earth.

But as the years passed, and He did not return His acts and deeds were recorded from memory, and told by letter to peoples in foreign lands. As time went on and Christianity grew, through its first century or so, other writings appeared. The collection of these is the New Testament of the Bible.

With this very sketchy historical background we approach the Bible to study it from the standpoint of the drugs it mentions. John Quincy Adams, sixth president of these United States, once said, "In what light soever we regard the Bible, whether with reference to revelation, to history, or to morality, it is an invaluable and inexhaustible mine of knowledge and virtue."

And so, to come to the point, let me quote from the twelfth verse of the 47th chapter of Ezekiel:

"And by the river upon the bank thereof, on this side and on that side, shall grow all trees for meat, . . . and the fruit thereof shall be for meat, and the leaf thereof for medicine."

Thus saith the Lord God, according to the prophet Ezekiel, in one of the four passages in the Bible in which the general term "medicine" is used. There is a similar passage in the second verse of the 22nd chapter of Revelation, saying that "the leaves of the tree were for the healing of the nations." Despite the few broad references to medicine, there is no scarcity of definitely named drugs, and it is of these specifics of the Scriptures that we shall speak this evening.

The mere mention of medicine and drugs implies sickness, of which there was an abundance in Biblical times, according to the writers. We find record of such afflictions as dropsy, deafness, palsy, fever, leprosy, paralysis, issues of blood, impediments of speech, total dumbness, withered hands and other infirmities, and multitudes of unnamed diseases. Most of the individual cases of these illnesses mentioned in the Bible were cured by the hand of Christ, the Divine Healer, rather than by drugs. His miraculous works seemed to be without bounds, for He cured the maimed, the halt, the lame and the

blind, He cast out devils (the insanity cases of today), and even raised the dead.

No one with faith was ignored, yet, although many cures were effected, the afflictions that remained were many, unhealed by Divine Providence as punishment for sin and wrongdoing. Egypt, as an example, suffered a plague of boils and blains during Moses' time. Leprosy, also, was widespread, it being the disease from which Lazarus is believed to have suffered, although there is no direct statement of this in the Bible. Heavenly benevolence, however, caused the cures to outnumber the physical tribulations, according to the scribes of the Scriptures.

Prevalence of the dread leprosy brought official action and recognition of it and other diseases as menaces to public health. The thirteenth and fourteenth chapters of Leviticus describe the method of determination of leprosy, the segregation of the unfortunate victims, and the elaborate, and, to us, vain, cleansing rites. The next chapter of the same book of the Bible describes the precautions necessary to prevent the spread of "running issues of the flesh." Sanitation, segregation, quarantine and fumigation, after a fashion, were evidently the practice even in Moses' time.

Physicians, however, had little or nothing to do with the health problems and medical cases spoken of in the Scriptures. Rather, the priests were the diagnosticians and healers, and the cures were brought about by spiritual, more than medical means. This was especially true in Egypt. Even James, in his epistle, writes, "Is any among you afflicted? Let him pray. Is any sick among you? Let him call for the elders of the church; and let them pray over him, anointing him with oil in the name of the Lord. And the prayer of faith shall save the sick." The Israelites, on the other hand, appealed to the prophets first, and took later recourse to the physicians and the apothecaries.

There was an exception to this general rule, and we read in II Chronicles, XVI, 12, that Asa, for 39 years King of Judah, was diseased in his feet, "Yet in his disease he sought not the Lord, but to the physicians." We are not told of the outcome of his doctors' efforts, but Asa died two years later from a cause unknown to us. Thereupon his people "laid him in the bed which was filled with sweet odours and divers kinds of spices prepared by the apothecaries' art."

From this it is evident that the art of the apothecary continued to serve the patient even after death. The doctor, too, had his post-

mortem duties. In Genesis L, 2, we find the passage, "And Joseph commanded his servants the physicians to embalm his father, and the physicians embalmed Israel." We will come upon the method of embalming in the discussion of the individual drugs.

It is to be especially noted that in the entire Bible there is no definite reference to any internal medicine, with directions for its use, or description of how the Biblical characters used it. Most of the medicaments are for external use, ointments and similar preparations predominating. Even in the numerous references to poisons there is no internal poison named, the sting of the asp and the serpent being the only specifics.

For the purpose of present convenience and future ready reference, let us consider the individual drugs and medicinal groups in alphabetical order.

Acacia

Numerous references in Exodus, and in Deuteronomy and in Isaiah, to the shittim, or shittah tree, mean the Acacia tree. Strong and powerful, its wood was much in demand for building purposes.

The dried, gummy exudation from various species of African Acacia is used in contemporary pharmacy to suspend ordinarily insoluble particles of substances in water. In other words, acacia is an emulsifying agent, an aid in making emulsions, whereby disagreeable oils and other medicines, unpalatable by themselves, are made into emulsions with acacia and water, flavored, and thus made easier to take. Acacia is also used as a binding agent for pills and similar pharmaceutical preparations.

Almonds

The almond, and the almond tree, well-known in Biblical times, is still with us today. In fact, there are two distinct almonds recognized now, the bitter and the sweet, while the Bible made no differentiation.

Prunus amygdalus amara, the bitter almond tree, yields ripe kernels which, in turn, yield the official bitter almond oil. Very rich in harmless benzaldehyde, which gives it its odor and taste, but containing from two to four per cent. of very poisonous hydrocyanic acid, this oil cannot be used for flavoring purposes. Synthetically prepared pure benzaldehyde, with all the odor and taste of the almond, but free from the poisonous acid, is the flavoring agent to be used with safety.

The ripe seeds of *Prunus amygdalus dulcis* constitute the sweet almond of the United States Pharmacopœia, which is used as a demulcent, a substance to allay irritation, or a lotion, whichever term you prefer. Genesis XLIII, 11, says, in part, "Carry the man a present, . . . a little honey, . . . nuts and almonds." Take away the nuts, combine the honey and the almonds in a cream, and what have you?—a famous skin lotion.

There is also official an expressed oil of almonds, obtained equally from the sweet and bitter varieties, a bland oil used externally as an emollient and internally as a laxative.

Aloes

Let me read from John XIX, 39 and 40,—"And there came also Nicodemus and brought a mixture of myrrh and aloes, about an hundred pounds weight. Then they took the body of Jesus and wound it in linen clothes with the spices, as the manner of the Jews is to bury."

Sweet and aromatic was the odor of the resinous substance contained in *Aquilaria agallocha*, a tree native in tropical Asia, and known as aloes. Its wood, strong, fragrant and beautiful, was much prized by the ancients, at one time being sold for more than its weight in gold. Beside its use in embalming, and in perfumes, it was thought to have marvelous curative properties, being somewhat of an alleged panacea.

We have an aloes in the medicine of today, but it is not that of old. Present-day aloes, bitter of taste and having powerful purgative properties, has many varieties, coming from various parts of the world. Strange as it may seem, the juice of these aloes was also used, at one time, in embalming.

Anise

See Dill.

Balm of Gilead

Another much-spoken-of external medicament was Balm of Gilead, a balsam from the *Balsamodendron Gileadense*, an Arabian tree, very difficult to cultivate. When grown successfully, it was guarded very diligently, and the desired product stored in the Royal Treasury. How reminiscent of the gold of America today, stored in the Royal Treasury, and sometimes known as Balm of the Palm.

Balm of Gilead was, of course, very valuable, and a great item of trade. The Ishmaelites who bought Joseph from his brothers (Gene-

sis XXXVII, 25) were transporting Balm of Gilead, myrrh and other spices to Egypt.

Gilead, itself, was a mountainous district in Palestine, and is mentioned in the eleventh verse of the forty-sixth chapter of the prophecy of Jeremiah, "Go up into Gilead, and take balm, O virgin, the daughter of Egypt: in vain shalt thou use many medicines, for thou shalt not be cured."

There is a Balm of Gilead Bud official in contemporary medicine, obtained from the leaf buds of *Populus nigra* or *Populus balsamifera*, native in North America. Internally it is used as a stimulating expectorant, externally in an ointment for slow healing sores.

Bdellium

See the last paragraph of the description of Myrrh.

Calamus

In the early nineteenth century it was supposed that the calamus of the ancients was one of the gentian family, but a carefully drawn table of comparative descriptions disproved this theory. Calamus was mentioned by Theophrastus, Dioscorides and Pliny, and referred to in the Biblical Song of Solomon as a spice, in addition to being used in Moses' Holy Anointing Oil. It was probably one of the aromatic Indian grasses. Some translations of the Bible, other than the King James, call this plant sweet cane, rather than calamus.

The calamus of today is also known as sweet flag, and is a marsh plant, the *Acorus calamus*. The root has been a common ingredient in dry perfumes since the days of the Greeks. Rattan is also known as calamus.

Cassia

Cassia is another of the sweet smelling spices used in the Holy Anointing Oil described in the 30th chapter of Exodus. It is a cheaper and coarser form of cinnamon, from which the volatile oil of cassia official in the Pharmacopœia of the United States, is obtained. The plant, *Cinnamomum cassia*, is cultivated in China, and its oil is almost identical with that of Ceylon cinnamon, to be described in a moment. Even though the Chinese oil is slightly inferior to the Ceylon oil, it meets with more favor and use because of the great difference in price.

Cinnamon

One of the ingredients of the oil of holy ointment, prescribed to Moses by the Lord, and written in Exodus XXX, 22 to 38, was cinnamon. Used as a spice and a perfume, sweet cinnamon is very familiar today, being highly esteemed because of its essential aromatic oil. The dried inner bark of *Cinnamomum zeylanicum*, a plant cultivated in Ceylon, is the official cinnamon of the Pharmacopoeia of the United States.

It is interesting to note that cinnamon was the most profitable vegetable product of Ceylon in 1831, the cultivation of the plant in the famous Cinnamon Garden of Ceylon being a monopoly of one company. This company guarded its garden very rigorously, being aided by the fact that very small portions of stolen bark could easily be detected by the strong, pleasant odor. Theft was punished by death, and anyone caught breaking off a branch of the plant had his arm cut off. This was, seemingly, a throwback to the Biblical "eye for an eye" and "tooth for a tooth" maxim. Ceylon cinnamon is now cultivated in a number of countries.

Coriander

Coriander, mentioned twice in Scriptures, is the dried ripe fruit of *Coriandrum sativum*, a small plant found in southern Continental and Eastern countries. It contains a volatile oil, used by itself in medicine as a stimulant and a corrective, as a flavor and condiment in the culinary art. Confectioners find some use for coriander seed, but it is more popular in Europe than in this country.

Cummin

The cummin, or cumin, of the Bible (Matthew XXIII, 23) is in little use today, although it, and its essential oil for which it is valued, are mentioned in pharmaceutical text-books as flavoring agents. Cumin is noted because of its resemblance to caraway, the former having a much stronger odor.

Dill

According to St. Matthew (XXIII, 23) Jesus berated the Pharisees, saying, "Ye pay tithe of mint and anise and cummin, and have omitted the weightier matters of the law."

Contrary to what you might expect, this anise is not the one familiar today, but is the common dill, used in the manufacture of dill

pickles. Unlike present-day anise, which is used extensively in pharmacy to flavor unpalatable doses, dill meets with more favor in the kitchen than in the prescription room.

Figs

The twentieth chapter of second Kings tells of an attack of boils suffered by Hezekiah, and he was "sick unto death." But at the prophet Isaiah's direction, figs were placed upon the boil, and he recovered. The story is repeated in the 38th chapter of Isaiah.

The fig, known by the Latin "Ficus carica" is this day an official drug, being used as a nutritious laxative food. The syrup is in widespread use as a laxative, being especially pleasant to take and very agreeable to children.

The partially dried fruit of the fig tree is the part used in medicine. The tree is a native of Persia and Syria, and is also cultivated quite extensively in California. As a household article it is a staple commodity.

Flax

Mentioned often in the Bible, flax has increased in importance, both commercially and medicinally, until, in 1930, the United States alone produced 23,682,000 bushels of flaxseed. Cultivation and utilization of the flax plant is one of the oldest of industries.

Flaxseed, the ripe seed of *Linum usitatissimum*, is official in the pharmacopœia as *Linum*, or linseed. Ground, it is bought by the pharmacist for making lutes, or coverings for joints in the various pieces of apparatus he is called upon to use. It is bought from the pharmacist to be used in poultices, a very widespread household remedy in certain sections.

It is said that meat packers use even the squeal of the pig. Flax seems to be the pig's counterpart in the plant kingdom, for beside the fiber, and the ground seed, another part used is the oil. It can be used in medicine as a laxative (and we pause to wonder at flax and lax), and due to its quick drying properties, linseed oil forms the basis for many paints and varnishes.

Frankincense

Of the three gifts of the Wise Men at the birth of Christ—gold, frankincense and myrrh—the latter two are the more familiar to the pharmaceutical profession in more ways than one. Frankincense be-

longs to the Bursuraceae, or Myrrh family of shrubs and trees, the part used being the gum resin from *Boswellia carterii*, being obtained by hardening the exudation from the tree by exposure to the air. It assumes a white or pink color and has a very agreeable odor, the quality for which it was used by the early Jews, Greeks and Romans, and even today.

The frankincense of the ancients is also known as Olibanum, and is native to East Africa and Arabia. The resinous product of the common fir and of American turpentine are often sold under the name of frankincense.

Galbanum

This is the third of the four sweet spices used in Moses' Holy Anointing Perfume (Exodus XXX). It is a brown gum resin with aromatic odor, but with bitter taste, and is derived from *Ferula galbaniflua*, a native of Persia and Afghanistan. Its brother, *Ferula foetida*, is the well-known and equally well-avoided asafoetida, which is sometimes adulterated with galbanum. It seems a shame to waste a pleasant smelling substance by mixing it with such a vile, odoriferous material like asafoetida, but I suppose adulteration is easy, a little of the asafoetida odor going a long way.

Galbanum itself is used in pill form with asafoetida, myrrh and syrup, as an expectorant, and in plaster form, with turpentine, burgundy pitch and lead plaster, for external application to indolent swellings.

Gall

When desiring to use a synonym or simile for bitterness, or anything unpleasant, the authors of Holy Writ used the term "gall and wormwood." In references to the bitterness of gall, alone, that secretion of the liver, bile, is meant, of course. But when gall is linked with wormwood, which is an herb, it is only fair to assume that the reference was to nutgalls, which are excrescences on the young twigs of *Quercus infectoria*. These excrescences, or hard tumor-like formations, are brought about by an insect, the *Cynips tinctora*, the female of which punctures the young leaf buds of the tree and deposits eggs in the hole. A hard lump is formed around the eggs while they undergo development. At the same time, great quantities, up to 70 per cent. of tannic acid are formed, and it is this constituent to which the drug owes its use as an astringent.

The galls official in the United States Pharmacopœia come from Greece and Persia.

Gold

"And when they were come into the house, they saw the young child with Mary his mother, and fell down, and worshipped him: and when they had opened their treasures, they presented unto him gifts; gold, and frankincense, and myrrh." (Matthew II, 11.)

It is not generally known that gold, the most precious of the three gifts of the Wise Men, is actually used in medicine. In ancient days it was used in leaf form to cover skin abrasions. Later it was a very important ingredient in the various elixirs of life, concocted, decocted and half-cocked to make the people believe they were the long sought panaceas. Today, gold in the form of a chloride, is used in combination with sodium chloride as an alterative, the internal dose being from one-twelfth to one-fourth of a grain. It is also used with arsenic bromide, and is unofficially used by itself as a bromide, a chloride and an iodide.

So much for the rather restricted use of gold in pharmacy and medicine. Some of our friends in these vocations, who are given to grumbling and groaning, state that they see about as little of this substance commercially as they do professionally.

Hemlock

The hemlock of scriptural passages has two meanings—bitter and poisonous. In its translation in the sixth chapter of Amos it is from the same root word as wormwood, to be described later as a symbol for bitterness. In the tenth chapter of Hosea, the translation of hemlock is again a general one, meaning poison or venom. The classical hemlock, which was made into a highball for Socrates' last round up, is not alluded to in either case.

Poison hemlock is an official drug known as Conium, the dried fruit of *Conium maculatum*. It is used in small doses as a narcotic and sedative, but caution must be taken that the drug is comparatively fresh, for after two years it is unfit for use. It's just a case of—Gosh all Hemlock!—if a stale sample is used.

Henna

Although the henna shrub is mentioned twice in the Bible, both times in the beautiful Song of Solomon, one could look all day for the word "henna" and not find it, for the King James translation calls

it camphire. Moffatts modern translation gave us the clue to henna.

Henna is a small shrub, the *Lawsonia alba*, sometimes called Egyptian privet. It is native in Arabia and Persia and has a fragrant flower and colorful, and coloring, leaf. These properties make the modern version of the word camphire fit right in with the other spices and perfumes of the Song of Solomon.

In its native land henna is used by the women to stain their nails and finger tips a brilliant orange. The men use it on themselves to dye their hair, and on their horses for the same thing. In America, however, the women use it on their hair, and for a good purpose, too, for gentlemen prefer red heads,—if they can't get blondes or brunettes.

Hyssop

"Purge me with hyssop, and I shall be clean," prayed David in the 51st Psalm, calling upon one of the more common plants for help. Hyssop is a member of the order *Labiatae*, the *Marjoram* family, and is native in Southern Europe and the East. For ages it has been cultivated in gardens for culinary use as a pot herb, the leaves and flowering tops containing the desired oil.

In the fourteenth chapter of Leviticus we read of hyssop being used as a cleansing agent for leprosy, but it is the spirit of the act and not the act itself that cures, for the hyssop is mixed with the blood of a bird and the blood sprinkled seven times on the unfortunate leper. We see here another of the predominant rites of divine healing, the directions for this act being given to Moses by the Lord.

Juniper

Job (XXX, 4) tells, in a parable, of some hungry people who cut up juniper roots to eat. Today the juniper berries are used to make a drink, specifically as a stimulant and a diuretic.

The berries are the dried ripe fruit of *Juniperis communis*, containing a volatile oil which imparts a pleasing odor, and, if we can take the word of those who used these berries to make a "verboten" beverage during Prohibition, a very pleasant taste.

Juniper's greatest contribution is its tar, for, as we all remember, it was the big fellow on the "ad" who took Juniper Tar, and the little fellow who didn't. The man who said that advertising pays was correct.

Mandrake

Mandrake, twice mentioned in the Bible, has had, very likely, the most colorful and lurid history of all the simples of the Scriptures. It is a member of the nightshade family, a botanical brother to such deadly fellows as belladonna, henbane and Jimson Weed. Described variously as a drug for insomnia, pain, gall-bladder trouble, eye pains, boils, erysipelas, and as a love philtre, the classical mandrake bears the Latin name *Mandragora officinalis* or *atropa mandragora*.

It was mandrake that Reuben gathered from the fields, "in the days of the wheat harvest," to give to Rachel, who was so despondent because her barrenness defeated her desire for children. The book of Genesis (XXX, 14), in which the story is told, continues to inform us that the drug was efficacious.

The plant has a fetid odor, but the thirteenth verse of the seventh chapter of the beautiful Song of Solomon would lead us to believe, from the context of the rest of the book, that the odor was rather agreeable.

Some students of the Bible and its lore believe that the hypnotic power of mandrake was employed upon Adam, to put him to sleep during that first major operation, the costalectomy during which Eve was created. Certainly the drug was used pre-operatively in the days before modern anæsthetics.

Theophrastus, often called the Father of Botany, and who lived in the fourth century B. C., stated that the leaves of the mandrake, mixed with rye, are useful as local applications for the dread erysipelas, that painful affliction, gout, and equally painful boils. Internally, he said, it would produce sleep and could be used as a love philtre.

Dioscorides, an early Greek writer on drugs, also stated the use of the drug in insomnia and pain, and further said that an infusion of it was good for the gall, and useful as an eyewash to relieve eye pain.

Pliny, another writer of about the same time, made much of mandrake's resemblance to the human form, and made many deductions as to the connection between this similarity and its actions on humans. Mostly superstitious, of course.

These and many other credulities are to be found in the folk lore of every European language, especially the German. For example, one story has it that when mandrake is gathered, a rope must be

ties from the tail of an all black dog to the mandrake, and the dog's power used to pull the root from the ground. It was essential, however, that a very loud horn be blown at the same time, in order to drown the shrieks of the mandrake as it was torn from its earthy home.

Even Shakespeare, in his Romeo and Juliet, refers to the shriek of the mandrake.

The root of the plant was also a fixed part of early witchcraft and sorcery, amulets of the drug being worn to make the wearer lucky in love, victorious in court, and supernatural all around. These beliefs were so great that fakers were easily able to sell fraudulent amulets made from other and less expensive sources.

European mandrake, that of the Bible, is not to be confused with American mandrake, a native drug handed down to us by the Indians, and widely known by the common names of May Apple, Devil's Apple and Ground Lemon. Its Latin name is *Podophyllum peltatum*, and it is used extensively as a cathartic.

Manna

Without being facetious, it might be said that manna is one of the most romantic drugs of the Bible. Many are the allusions to "manna from Heaven," but the allusions were all illusions, for the manna was merely the sugary exudation falling from the tops of the shrub *Tamarix manniifera*, after having been punctured by the insect *Coccus manniparus*. The Arabs and the Greeks had a use for it, for they collected the fallen manna and ate it as they would honey.

A quotation or two from the Scriptures may lead our thoughts in another direction—

"And when the dew that lay was gone up, behold, upon the face of the wilderness there lay a small round thing, as small as the hoar frost on the ground.

"And when the children of Israel saw it, they said one to another, It is manna: for they whist not what it was. And Moses said unto them, This is the bread which the Lord hath given you to eat." (Exodus, XVI, 14 and 15.)

And again, in the story of the Israelites' march. (Numbers XI, 7, 8 and 9):

"And the manna was as coriander seed, and the colour thereof as the colour of bdellium.

"And the people went about, and gathered it, and ground it in mills, or beat it in a mortar, and baked it in pans, and made cakes of it: and the taste of it was as the taste of fresh oil.

"And when the dew fell upon the camp in the night, the manna fell upon it."

In Psalms, LXXVIII, 24—"And had rained down manna upon them to eat, and had given them the corn of heaven."

Could we not infer from these passages that manna was some wild grain, found only in the wilderness? However, historians seem agreed on the *Tamarix mannifera* shrub, of the Mount Sinai region.

The manna of today is a similar saccharine exudation but comes, however, from the tree *Fraxinus Ornus*, cultivated chiefly in Sicily and Calabria. It is not the manna of the Bible. Present-day manna is used as a laxative.

Mint.

Mint, mentioned twice in the New Testament as one of a number of valued products with which the people of the times paid their traditional tithes, was one of the large mint family of which two are official today. The one is *Mentha piperita*, our well-known peppermint, and the other *Mentha viridis*, the equally well-known spearmint. Both owe their flavoring and, should we say, perfuming qualities to essential oils, and their widespread use obviates the necessity of any further description. May it be enough that one of these mints was immortalized in song by one of the would-be bards of Tin Pan Alley when he wrote the famous, or infamous popular hit, "Does the spearmint lose its flavor on the bedpost over night?"

Mustard Seed

The mustard seed of the parables in the thirteenth and seventeenth chapters of St. Matthew is another of the drugs in use today. All of us are familiar with the mustard plaster and the mustard foot bath—and how we have suffered as plasters seemed to burn clear through our chests to get at deep-seated colds. However, we cannot overlook its more pleasant use as a condiment.

The ripe seeds of *Sinapis alba*, or white mustard, and *Brassica nigra*, or black mustard, are the parts used. Volatile oil of mustard, from the seed of the black variety, is a powerful rubefacient and must be handled with great care. The mustard plants are native in Southern Europe and Asia. The finished product of commerce seems native mostly on the hot dog.

Myrrh

This is the third of the three gifts of the Magi, all familiar to present-day medicine. In all probabilities, myrrh is the earliest known aromatic gum, written records of it having been made about 2000 B. C., and consistently thereafter. It was one of the chief ingredients in Moses' Anointing Oil (Exodus XXX) and was used in Biblical times as an embalming agent together with aloes (John XIX, 39 and 40).

There is a legend of the origin of the myrrh tree, as related by Ovid, the Roman poet. It seems that in some manner dishonor was brought to the family of the King of Cyprus by his daughter, Myrrha. As a consequence she was ejected from her home, and, in her wanderings became lost in the Arabian desert. There she beseeched the gods for forgiveness, and in her agony asked to be removed from the living but not to be placed among the dead. Her pleas were answered in her transformation into the myrrh tree.

The tree *Balsamodendron myrrha* produces the gum resin which is dark brown in color, hard and brittle, balsamic in odor and aromatic and bitter in taste. It is produced chiefly along the eastern shore of the Red Sea and in Southern Arabia.

Myrrh is used in many pharmaceutical preparations as a tonic and a stimulant, and as an external application to wounds and abrasions. It is also extensively used as a mouth wash.

A similar gum resin known as Bdellium is sometimes confused with myrrh, but a series of chemical and organoleptic tests can be used to differentiate the two.

Ointments and Anointing Oils

Scriptural ointments were divided into three classes, holy ointments, luxurious perfumes and curative agents.

One of the most famous ointments referred to in the Bible is the familiar Holy Ointment of Moses. Let us read Exodus XXX, 22 to 33:

"Moreover, the Lord spake unto Moses, saying,

"Take thou also unto thee principal spices, of pure myrrh five hundred shekels, and of sweet cinnamon half so much, even, two hundred and fifty shekels, and of sweet calamus two hundred and fifty shekels.

"And of cassia five hundred shekels, after the shekel of the sanctuary, and of oil-olive an hin;

"And thou shalt make it an oil of holy ointment, an ointment compounded after the art of the apothecary: it shall be an holy anointing oil.

"And thou shalt anoint the tabernacle of the congregation therewith, and the ark of the testimony,

"And the table and all his vessels, and the candlestick and his vessels, and the altar of incense,

"And the altar of burnt-offering with all his vessels, and the laver and his foot.

"And thou shalt sanctify them, that they may be most holy: whatsoever toucheth them shall be holy.

"And thou shalt anoint Aaron and his sons, and consecrate them, that they may minister unto me in the priest's office.

"And thou shalt speak unto the children of Israel, saying, This shall be an holy anointing oil unto me throughout your generations.

"Upon man's flesh shall it not be poured; neither shall ye make any other like it, after the composition of it: it is holy, and it shall be holy unto you.

"Whosoever compoundeth any like it, or whosoever putteth any of it upon a stranger, shall even be cut off from his people."

A shekel was about 225 grains, and a hin was the equivalent of $5\frac{1}{2}$ quarts.

This lengthy passage indicates clearly that this ointment was not meant for medicinal use. Such is the case in most other Biblical references to ointments. In fact, many translators and authorities believe that the word apothecary in the foregoing quotation should be perfumer, which would seem to be more in keeping with the text. If that is the case, the word ointment should be changed to pomade. The Hebrew word "rakach" is inaccurately and difficultly translated into English as "apothecary", "compound" and other words, but the general meaning is to mix well-cut spices with oils. This would describe either the apothecary or the perfumer.

Almost every religious rite, seemingly, involved the act of anointment. David, youngest son of Jesse, was anointed King (I Samuel XVI, 12). Aaron anointed a priest, as an act of petition, to make atonement on the death of his two sons (Leviticus XVI, 32). Hazael was anointed King over Syria, Jehu was anointed King over Israel, and Elisha was anointed prophet (I Kings XIX, 15). Even the tabernacle was anointed, as we read just a moment ago.

Perhaps the most pious act of anointment is contained in the Gospel according to St. John, the third verse of the twelfth chapter. Here Mary, sister of Lazarus, anointed the feet of Jesus with a pound

of ointment of spikenard, in gratitude at the raising of her brother from the dead.

Again, when Jesus was in Bethany, at the house of Simon, the leper, a woman anointed his head with precious ointment from a very costly alabaster box (Matthew XXVI, 6-11).

And, in Luke VII, 37 and 38, we read of still another woman, "a sinner," who anointed Jesus' feet with an ointment from an alabaster box, while the Saviour was partaking of a meal in the Pharisee's house.

The possessive value of ointments is indicated in II Kings XX, 13, telling of the precious gold, silver, spices and ointments owned and proudly exhibited by Hezekiah. Proverbs XXVII, 9, tells us that "ointment and perfume rejoice the heart." And Ecclesiastes VII, 1, "a good name is better than precious ointment." The sixth verse of the sixth chapter of Amos describes the land of Israel as containing wanton people "That drink wine in bowls and anoint themselves with the chief ointments."

However, certain undescribed ointments were used for their curative powers, some in ritual manner, some not. The first group is identified in James V, 14, "Is any sick among you? Let him call for the elders of the Church, and let them pray over him, anointing him with oil in the name of the Lord." The second group can be recognized in Isaiah I, 6, in which the conditions in Judah are bewailed, "From the sole of the foot even unto the head there is no soundness in it; but wounds, and bruises, and putrifying sores; they have not been closed, neither bound up, neither mollified with ointment."

A fitting quotation with which to close this section on ointments is the famous passage in Ecclesiastes X, 1, "Dead flies cause the ointment of the apothecary to send forth a stinking savour: so doth a little folly him that is in reputation for wisdom and honour." The moral intended is quite apparent.

Olive Oil

This is an article of such common use today that it does not seem necessary to go into great detail concerning it. Olive oil was the liquid vehicle in which the principal spices, myrrh, cinnamon, calamus and cassia were mixed to make Moses' Holy Anointing Oil. No doubt other general Biblical references to oil mean olive oil.

It is a fixed oil pressed from the ripe fruit of *Olea Europea*, Italy supplying the bulk of the product. The culinary arts claim its

use as much as the professions of medicine and pharmacy. In the latter its bland, agreeable qualities make it ideal for emollient purposes in making cerates, ointments, liniments and plasters.

We must not forget, at this point the well-meaning barber who remarks, while cutting your hair, that it is getting a little thin on top, and a good olive-oil shampoo might help. Mustn't forget, did I say? We *can't* forget.

Onycha

Although onycha is not in use today, it is interesting to note it as an ingredient in the Holy Anointing Perfume of Moses and to note further that it is now believed to have been derived from a type of sea-snail abounding in the Red Sea.

Pomegranate

In the beautiful Song of Solomon (VI, 7), describing, in metaphor, Christ and the Church, is the verse "As a piece of pomegranate are thy temples within thy locks." In many other places in early literature, especially of the Orient, is pomegranate used as a symbol.

The bark of the *Punica Granatum*, of Southwest Asia and Southern Europe, is official in the present pharmacopoeia being used as an anthelmintic and bearing the common name of pomegranate. It has a bitter taste and is quite astringent.

Saffron

Here is another Biblical drug in use today. Spanish saffron, consisting of the stigmas and styles of *Crocus sativa*, is a yellow coloring and flavoring agent. It has also been used, rather ineffectually, as a tonic and as an anodyne.

Spanish saffron is sometimes adulterated with an American variety, but the latter is much inferior. In the seventeenth century there was an English saffron very abundantly exported. As is inferred by the name, most of the supply of this drug comes from Spain, although it is cultivated in Italy, Germany, France and a few other countries.

Sandalwood

Second Chronicles contains three references to *Algum* trees. First Kings contains three references to *Almug* trees. Both books meant what is now known as the sandalwood tree, but as there are three varieties of sandalwood tree, the white, the yellow and the red,

Algum may have meant one variety and Almug another. However, in both scriptural connections, the tree is used as a very strong building material.

Today, the white sandalwood, *Santalum album*, is official for its heartwood, and valued for its perfuming qualities, and its ability to repel insects, thereby making ideal storage containers. The volatile oil of white sandalwood is in widespread use as a stimulant to mucous membranes, especially in diseases of the genito-urinary tract.

There are also a yellow variety and a red variety of sandalwood, the latter being used as a dyestuff in certain pharmaceutical preparations. All three varieties are natives of India.

Spikenard

Spikenard was the chief ingredient in the ointment with which Mary, sister of Lazarus, anointed the feet of Jesus (John XII, 3). Its value lies primarily in its exquisite odor, due to an oil similar to attar of roses. Strange as it may seem, spikenard, despite its fragrant odor, belongs to the valerian family, the name of the plant being *Nardostachya Jatamansi*, native in India.

The pound of spikenard ointment used by Mary was very costly, and her act made Judas Iscariot ask, "Why was not this ointment sold for three hundred pence, and given to the poor?" To which Jesus gave his very famous reply, "Let her alone: Against the day of my burying hath she kept this. For the poor always ye have with you, but me ye have not always."

Stacte

Directly following the recipe for the Holy Anointing Oil in Exodus XXX is a formula for Holy Anointing Perfume.

"And the Lord said unto Moses, Take unto thee sweet spices, stacte, and onycha, and galbanum; these sweet spices, with pure frankincense: of each shall there be a like weight.

"And thou shalt make it a perfume, a confection after the art of the apothecary tempered together, pure and holy:

"And thou shalt beat some of it very small, and put of it before the testimony in the tabernacle of the congregation, where I will meet with thee: it shall be unto you most holy.

"And as for the perfume which thou shalt make, ye shall not make to yourselves according to the composition thereof: it shall be unto thee holy for the Lord.

"Whosoever shall make like unto that, to smell thereto, shall even be cut off from his people."

Stacte is a term no longer used, but it is thought that it referred to a variety of myrrh, previously described. The word stacte meant "a dropping", evidently the liquid exudation of the myrrh tree, as talked of by Pliny and Theophrastus, and much in vogue in Rome in the fourth century.

Wine

The Biblical story of the miraculous turning of water into wine indicates that wine was a common beverage and its moderate use unfrowned upon by any forerunners of our contemporary W. C. T. U. Even in Timothy V, 23, Paul admonishes Timothy to "Drink no longer water, but use a little wine for thy stomach's sake, and thine often infirmities." But a further admonition and warning appears in Proverbs that "Drunkenness destroys health." And the wantonness of the land of Israel is described by Amos (VI, 6), who decries the inhabitants "that drink wine in bowls and anoint themselves with chief ointments."

We are all familiar with the story of the Good Samaritan who poured the soothing and healing oil and wine on the wounds of the unfortunate traveler. Here the external use of wine, probably relying upon its alcoholic content as an antiseptic, is established.

Wormwood

This drug is the second half of the much quoted duet of bitters, "gall and wormwood." One quotation might be made in reference to it.

"And the third angel sounded, and there fell a great star from Heaven, burning as it were a lamp, and it fell upon a third part of the rivers, and upon the fountain of waters.

"And the name of the star is called Wormwood: and the third part of the waters became Wormwood; and many men died of the waters, because they were made bitter." (Revelation VIII, 10 and 11.)

The wormwood of medical use is the perennial herb, *Artemesia absinthium*, native in Europe and cultivated to some extent in the United States. From parts of the plant is obtained an exceedingly bitter drug used sometimes as an anthelmintic, or worm remedy, and sometimes as a tonic. The Europeans make most use of it as a flavoring agent in beer and also in the manufacture of absinthe. I suppose these three latter uses might all be grouped under the general term of "tonics."

And so, we have run the gamut of Biblical drugs from A to W, if not from A to Z. And it occurs to the lecturer that if we were looking to the Bible for medical aid we were looking in the wrong place.

For spiritual health, however, the Scriptures do give us a warning against wickedness (Jeremiah XXX, 13), "There is none to plead thy cause, that thou mayest be bound up: thou hast no healing medicines." They also give us a wonderful prescription, in Proverbs III, 7 and 8, "Fear the Lord, and depart from evil. It shall be health to thy navel, and marrow to thy bones."

Finally, Holy Writ leaves us with a bit of promise and optimism in Proverbs XVII, 22, "A merry heart doeth good like a medicine: but a broken spirit drieth the bones."

PLANT CHEMISTRY OCCURS IN STEPS—Plants do not build up the complex sugars and starches and protein matters in a single step, using the air and water as raw materials, but at least five steps and probably many more are involved. Dr. Dean Burk, of the United States Department of Agriculture, announced at the symposium on photosynthesis held last week at the Long Island Biological Laboratories at Cold Spring Harbor. The operations are directed by the chlorophyll, the green coloring matter in plants, which first builds a primitive carbohydrate out of carbon dioxide and water, using the energy from sunlight which remains trapped in the molecule, and raises it to a higher chemical energy level at which the chlorophyll can carry on a second stage and then higher stages. The research is directed toward finding out how plants utilize, or fix, nitrogen at ordinary temperatures and pressures, a feat which man has been able to accomplish only at high temperatures and under great pressures. Some of the plant processes seem to store energy in the carbon dioxide fixing processes and then break down these carbohydrates in order to use the energy to fix nitrogen in combination.

ELEAZAR L. COHEN

One of the Founders of the Philadelphia College of Pharmacy*

By Aaron Lichtin, Ph. G.

IN the list (1) of the sixty-eight Philadelphia apothecaries who founded the Philadelphia College of Pharmacy in 1821 is mentioned the name of Eleazar L. Cohen. He was born in Lancaster (?), Pa., in 1792, the son of Solomon Myers Cohen and Bilah Simon, (affectionately referred to as Bell) daughter of Joseph Simon (1712-1804), one of the early settlers of Lancaster and one who left his impress on the history of that city. On his mother's side he was related to the well-known Gratz family of Philadelphia, for Mrs. Cohen and Mrs. Michael Gratz née Miriam Simon were sisters. One of Michael Gratz's sons was Simon Gratz, one of the founders of the Pennsylvania Academy of the Fine Arts, while Rebecca Gratz, the prototype of the Rebecca of Sir Walter Scott's Ivanhoe was a daughter. This brief genealogy is of interest in order to properly appraise certain influences on Eleazar's life.

Solomon Myers Cohen, Eleazar's father, was a merchant. He was one of the five signers of a Memorial of the Jewish Congregation of Philadelphia, issued September 12th, 1782, notifying the President, Vice-President and Council of the General Assembly of the Commonwealth that Congregation Mikveh Israel will be dedicated. The Congregation is now located at Broad and York Streets, Philadelphia. Solomon Myers Cohen died in 1796, when Eleazar was but four years old, leaving a family of eight children. His wife Bilah not only shared in the estate of her father, Joseph Simon, but was also an executrix. This placed the rest of the Cohen family in a moderately well financial position.

Eleazar went into the retail drug business in 1819, in partnership with his brother A. M. Cohen, and continued in it until 1840. They were variously located and at one time owned two stores, namely at 453 High Street (now Market Street) and seven South Seventh Street. For a short time Simon, another brother, known as a botanist, was also a partner. In 1821, at the age of twenty-nine, he participated in the founding of the Philadelphia College of Pharmacy, at the memorable meeting, held at the historic Carpenter's Hall, on February

*Presented at the meeting of the Pennsylvania Pharmaceutical Association, June, 1935.

23d, of that year. He was one of the young men, who, in the words of Dean LaWall, made the founding of the College "an enterprise of youth". (2)

The somewhat comfortable position of the Cohen family did not last very long, however, and was adversely and seriously affected by a long legal battle first with Michael Gratz, then with the latter's son Simon over the will of Joseph Simon, who, in fact foreshadowed it in the following extract from his long will, dated October 29th, 1799: (3) "And whereas I have received many hardships from my son-in-law Gratz and his son, and in settlement of our accounts they have taken an unfair advantage by reason whereof they have in an indirect way received a full proportion if not more . . . , I do hereby declare that I have devised to my daughter Miriam and after her death to her children the third part of the residue of my estate or in a certain event a fourth part of such residue, upon this express condition that within three months after my decease, by writing tendered to my executors, the residue of the money so awarded and all claims respecting it be fully released to my executors so that the same shall not come as a charge or debt against my estate, I being content to lose what I already paid".

The long legal battle resulted in the condemnation, by order of the Court, of considerable property held by the Cohen family in favor of Simon Gratz. In 1832 Mrs. Cohen was thus described by Rebecca Gratz: "She has trod a rugged path, in the long years of widowhood and poverty". (4) She died January 28th, 1833, and to quote Rebecca Gratz: "When I think of poor Aunt Bell and the change that a year, a dying year made in her whole being—how tremblingly the cup of life was held to her lips till she had drained the last drop." (4)

Eleazar was deeply religious, of a modest and retiring disposition and he never married. Little is known of him from the time he retired from business until his death. No doubt, due to the financial reverses and the death of his mother, the family home located at the then fashionable Fourth and Spruce Streets was given up and Eleazar moved to a second floor apartment on Coates Street, now Fairmount Avenue. Despite the splendid family connections in finance and public life, he never quite recovered from his losses and died destitute in a boarding house on North Tenth Street, in Philadelphia. (5) So poor was he that his estate was not sufficiently large enough to pay for a tombstone to be placed on his grave and it thus remains unmarked

to this day at the cemetery, at Tenth and Federal Streets, in Philadelphia.

REFERENCES

1. First Century of the Philadelphia College of Pharmacy, page 56, Philadelphia, 1922.
2. *Ibid.*, page 290.
3. Gratz vs. Simon; papers in the Library of the University of Pennsylvania, Philadelphia.
4. Letters of Rebecca Gratz, edited by David Philipson, pp. 163 and 173, Philadelphia, 1929.
5. His brother Joseph was prothonotary to the Supreme Court of Pennsylvania, 1840-1853; Hyman Gratz, a cousin, was President of the Pennsylvania Company for Insurances on Lives and Granting Annuities, a strong financial institution, 1837-1857.

THE ARSENIC CONTENT OF HONEY AND BEES AFTER DUSTING WITH ARSENICALS. G. LOCKEMANN. *Z. Untersuch. Lebensm.*, 69, 80 (Jan., 1935).—A field of rape in bloom was dusted with arsenicals. Soon after this the bees from neighboring hives died in masses. The question arose as to whether the honey might contain sufficient As to make it unfit for food. Chemical analyses showed that the honey contained 1 part by weight of As in 5-10 million parts of honey. Since this amount lies within the limits of the normal occurrence of As in nature, the honey can be used without fear.

The bodies of the dead bees contained 1 part of As to 32,000-48,000 parts by weight of bees. The lethal dose for man according to appropriate handbooks is 0.1-0.3 g. As_2O_3 or 1-750,000 to 1-250,000; for warm-blooded animals 0.015 g. As_2O_3 to 1 kg. of body weight or 1-60,000. Since the As content of the bees was below the latter, it is possible that they were killed by a smaller dose. (E. D. W., *Jour. Chem. Educ.*)

CATARACTS FOLLOWED USE OF DINITROPHENOL FOR REDUCING—
The medical evidence grows more damaging against the new reducing drug, dinitrophenol.

Six cases of cataract, rare in young women, in which the only common factor has been the use of this drug in weight reduction, are reported by three San Francisco physicians. (*Journal, American Medical Association*, July 13.)

**THE ONE HUNDRED AND THIRTEENTH ANNUAL
COMMENCEMENT OF THE PHILADELPHIA
COLLEGE OF PHARMACY AND SCIENCE**

THE One Hundred and Thirteenth Annual Commencement of the Philadelphia College of Pharmacy and Science was held Wednesday, June 5th, 1935, at eight P. M., Daylight Saving Time, in the Auditorium of the College, Forty-third Street, Woodland and Kingessing Avenues, Philadelphia.

A large gathering attended the formal exercises and listened with interest to the splendid graduation address * delivered by Dr. Geo. W. McCoy, Director, Natural Institute of Health, Washington, D. C. Degrees were conferred as follows:

DOCTOR OF PHARMACY (Honoris Causa)

William Alexander Pearson

MASTER OF PHARMACY (Honoris Causa)

Eli Lilly John Montgomery Woodside

CANDIDATES FOR DEGREES CONFERRED IN COURSE

DOCTOR OF SCIENCE IN CHEMISTRY

George Martin Goeller

DOCTOR OF PHARMACY

William Allen Prout

MASTER OF SCIENCE IN CHEMISTRY

William George Batt	Harry Mack
Kenneth Low Kelly	William Lewis McClintock, Jr.
Lewis Joseph Kleckner	Linwood Franklin Tice

MASTER OF SCIENCE IN PHARMACY

John M. Muroff

MASTER OF SCIENCE IN BACTERIOLOGY

Donald Charles Atwood Butts

BACHELOR OF SCIENCE IN CHEMISTRY

William Frederick Happich, Jr.	Edward William O'Brien
Charles William Heathcote, Jr.	Samuel A. Rogers
Arnold Bernard Koff	Philip Rubenfein
Wayne Conwell Nichols	Raymond Steiner
John Joseph Yeager	

*This address appeared in the June issue of this Journal.

BACHELOR OF SCIENCE IN PHARMACY

Morris Jack Babis	Selvin Gumbs
George Thomas Demopoulos	Allen Arthur Hower
Leander James Eckels	Olga Helen Jonkus
Harold Alcide Emery	Elliott Emerson Leuallen
Norman Edmund Foster	Sidney Levine
Walter Clifford Fulmer	Samuel Cyrus Schreiber
Saul Gillick	Eugene Henry Strittmatter
Max Goldman, Jr.	James George Weston
Sidney Harry Gubin	Jo May Zeisig

BACHELOR OF SCIENCE IN BACTERIOLOGY

Albert Paul Gunsser	Anna Mae Mandes
	Meredith William Pettit

GRADUATE IN PHARMACY

Frank F. Black	Louis Josef Salerno
Charles Jerome Gallagher	Albert Serfilippo
Samuel Whitney Irvin	Frank Joseph Tolomeo
Vincent William McHale	William Theodore Weiland

CANDIDATES WHO HAVE COMPLETED SPECIAL COURSES
AND HAVE QUALIFIED FOR CERTIFICATES

(This does not include students who completed courses in these subjects for
credits for a degree)

FOR CERTIFICATES IN CLINICAL CHEMISTRY

Dorothy Thomas Bright	Jean deSales Fahey
David Flegel Burgoon	Mariana Annunciata McGinty
Irene Rita Dreier	Gladys Cecelia Olsen
	Sara Wolf

FOR CERTIFICATES IN BACTERIOLOGY

Dorothy Thomas Bright	Irene Rita Dreier
David Flegel Burgoon	Gladys Cecelia Olsen
David Maxwell Caplan	Sara Wolf

FOR CERTIFICATES IN PHYSIOLOGICAL ASSAYING

Rudolph Hamma Blythe	Benjamin Goodman
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Award of Prizes 1935

Designated as "Distinguished"

With General Average Over 90%

BACHELOR OF SCIENCE IN PHARMACY

Norman Edmund Foster	Eugene Henry Strittmatter
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BACHELOR OF SCIENCE IN BACTERIOLOGY

Albert Paul Gunsser

Designated as "Meritorious"
With General Average Between 87% and 90%
BACHELOR OF SCIENCE IN PHARMACY

Harold Alcide Emery	Sidney Harry Gubin
Walter Clifford Fulmer	Elliott Emerson Leuallen
Saul Gillick	Jo May Zeisig

BACHELOR OF SCIENCE IN CHEMISTRY

William Frederick Happich, Jr.

THE PROCTER PRIZE, a gold medal for the highest average of the class, is awarded to:

NORMAN EDMUND FOSTER	
Honorable Mention to	
Elliott Emerson Leuallen	Jo May Zeisig

THE WILLIAM B. WEBB MEMORIAL PRIZE, twenty dollars and a bronze medal for the highest general average in the branches of Operative Pharmacy, Analytical Chemistry and Pharmacognosy, is awarded to:

EUGENE HENRY STRITTMATTER	
Honorable Mention to	
Harold Alcide Emery	Saul Gillick
Walter Clifford Fulmer	Sidney Harry Gubin
Jo May Zeisig	

THE FRANK GIBBS RYAN PRIZE, a gold medal endowed by the Class of 1884, as a memorial to their distinguished classmate, for the best average in the Chemical and Pharmaceutical Laboratory Courses, is awarded to:

NORMAN EDMUND FOSTER	
Honorable Mention to	
Harold Alcide Emery	Saul Gillick
Walter Clifford Fulmer	Eugene Henry Strittmatter

THE REMINGTON MEMORIAL PRIZE, twenty dollars, offered by the Estate of Joseph P. Remington, for the highest average in the examination of Operative Pharmacy and Dispensing, is awarded to:

EUGENE HENRY STRITTMATTER	
Honorable Mention to	
Walter Clifford Fulmer	Saul Gillick

THE MAHLON N. KLINE THEORETICAL PHARMACY PRIZE, fifty dollars in cash, offered by the Mahlon N. Kline Estate, for the highest average in Theory and Practice of Pharmacy, is awarded to:

NORMAN EDMUND FOSTER	
Honorable Mention to	
Walter Clifford Fulmer	Eugene Henry Strittmatter
Saul Gillick	Jo May Zeisig

The FREDERICK WILLIAM HAUSSMANN MEMORIAL PRIZE of one hundred dollars, given to the Pharmacy student with the highest average for the last three years of the course, is warded to:

NORMAN EDMUND FOSTER

Honorable Mention to

Harold Alcide Emery

Saul Gillick

Walter Clifford Fulmer

Elliott Emerson Leuellen

Eugene Henry Strittmatter

Gold Medals awarded by the Alumni Association to the student of the B. Sc. Class in Pharmacy and to the student of the B. Sc. Class in Chemistry, in Bacteriology, or in Biology who attain the highest scholastic averages, are awarded to:

B. Sc. in Pharmacy EUGENE HENRY STRITTMATTER

B. Sc. in Bacteriology ALBERT PAUL GUNSSER

A prize of twenty-five dollars offered by THE WOMEN'S AUXILIARY OF THE DAUPHIN COUNTY PHARMACEUTICAL ASSOCIATION to the girl graduating with the highest average:

Jo MAY ZEISIG

Honorable Mention to

Anna May Mandes

SHARP AND DOHME WINDOW PRIZES

First Prize, twenty-five dollars, to:

Louis Josef Salerno

Frank Joseph Tolomeo

Second Prize, fifteen dollars, to:

George Thomas Demopoulos

Harold Alcide Emery

Third Prize, ten dollars, to:

Allen Arthur Hower

Sidney Levine

SODIUM RHODANATE USELESS FOR MENTAL DISEASE—Sodium rhodanate, contrary to claims advanced for it, is of no value in treating mental disease, Dr. Purcell G. Schube, of the Boston State Hospital, has found. His opinion, based on experience with 75 patients suffering from various mental disorders, is reported to the *American Journal of Psychiatry* (May).

The sodium rhodanate treatment was advocated by Prof. W. B. Bancroft of Cornell University, who suggested that mental disease, dementia precox and manic-depressive psychoses by the contrasted use of sodium amyta and sodium rhodanate.

Dr. Schube found, contrary to Prof. Bancroft's views, that it is impossible to differentiate between two types of mental disease, dementia precox and manic-depressive psychoses, by the contrasted use of sodium amyta and sodium rhodanate.

SOLID EXTRACTS

By Ivor Griffith, Ph. M., Sc. D.

*A pinheaded Philadelphia columnist pillories and pities a poor scientist, recently reported in the papers as recording the song or the sounds of a "cricket on the hearth," strumming his tegminal tune to tempt the Mrs. *Nemobius Fasciatus* to be.*

A fellow like that, carps the columnist, should be at least a Senator—and do a bit of first hand chirping himself.

But the columnist's pity is poorly placed. Listen.—The devices which are developed in this kind of scientific study have highly important practical applications in the production and detection of sounds under water, as a means of signalling between vessels or of finding the depth of the sea by timing echoes, or in detecting vessels by means of supersonic noises produced by the vibration of their hulls or propellers.

By the way, speaking of sounds beyond the range of human ears who has ever listened to the song of the humming bird and watched his mouth quiver long after the audible song was suddenly done, without wondering why his symphony was so clearly unfinished?

Actually he had reached the supersonic heights where the human ear ceased to function and his song went on to the very end though none was there who could hear it. The vibrations had gone beyond the audible range of 18,000 per second—and there the human ear quits!

Termites erroneously called "white ants" and "flying ants" are not ants at all, though the working termite is white and the swarming termite flies.

They now inhabit forty-five out of our forty-eight states and constitute one of the real insect menaces, which according to one pessimistic professor, will some day tumble the kingdom of man.

They have a digestive system that makes a goat look like an invalid. They have been known to attack furniture, clothing, shoes, books, paper, living vegetation, mummies, coffins in graves, bones, elephant tusks, ivory, human cadavers protected by formaldehyde, lead sheathing, rubber insulation and lime mortar.

Why is the re-lighted stump of a cigar more "authoritative" than a fresh cigar of the same brand and nicotine content? This is the professor's answer,—"The amount of nicotine and other materials removed from smoke by passing through the tobacco of the unburned part of the cigar varies with the amount of the smoke so passing, and its concentration, as well as with the dryness of the smoke, the rate of suction, the temperature of the smoke and of the tobacco, the length of the stump, the fineness of the particles of tobacco, and the firmness of the wrapping, and so forth. The amount of nicotine found in the stump of a cigar which had been smoked with a strong continuous suction to the two-thirds mark was found to have increased by 66 per cent. over the average nicotine content of this brand of cigar. Which suggests that always the mildest part of the cigar is the part in front of the "stump".

The world-wide occurrence of arsenic, at sea and on land, is not generally known. We refer of course, not to the widespread use of this poison as an insecticide but to its natural occurrence. Even certain mineral waters are said to contain appreciable amounts of it. Thus the renowned spring at Vichy, France, provides a mineral water which, among other constituents, contains a little arsenic, namely, about two parts per million. The Koch Brunnen in Wiesbaden, the springs at Orsola in the Tyrolean Alps, the Lorenz Quelle in Switzerland, and the waters of numerous other springs in Europe, contain arsenic. So likewise do some of our American spring waters particularly those of the Yellowstone region;—even Old Faithful, the geyser renowned because of its reliability of performance, and which no visitor to the Yellowstone misses seeing, spouts a little arsenic.

Elsewhere insect damage to property was referred to as alarming, but insect damage to crops is still more appalling. Sanderson and Pairs give an estimate of the annual losses chargeable to insect pests at about \$2,266,000,000. Which almost parallels the expenditures of another prevalent pest.—Ask any Republican!

The two authors just cited state, "After all, the actual figures as given above mean little to most of us; if we should say rather that the net income of the average farmer might be one-fourth greater and foodstuffs and clothing still cheaper than at present if it were not for the activities of several insects we might convey more clearly the menace of insects to the people of the country as a whole in a better fashion."

"Drink water when thirsty" and "drink water frequently rather than drink much at a time," were the aqueous aphorisms of Dr. Wiley, the famous dietary expert.

The temperature of water and other body imbibitions was a matter of much concern with Dr. Wiley. Warm water before breakfast he favored, but ice water never. He strongly advised against the drinking of water, especially in hot weather at a temperature lower than 50 degrees Fahrenheit. And so positive was he of the value of this advice that he crystallized his sentiment in song—

*"Full many a dumb-bell, young and old,
Has gone to his gray sarcophagus
By pouring water icy cold
Adown his hot esophagus."*

Boiled and cooled water, too, he interdicted, except in emergency, this probably because the boiling of water expels air and oxygen.

It is customary in some hospitals to use tap water in manufacturing normal salt solution and other such operating room accessories. This is to be discouraged for when such liquids are sterilized they actually develop enough alkalinity to raise them far beyond the range

intended for them. To avoid irritation it is insisted with Dakin's solution, for instance, that it be not alkaline, yet it is a fact that water as delivered by the large municipalities and subsequently heat sterilized is far more alkaline than that famous surgical liquid, and therefore is an irritant as a wound dressing to say nothing of its dangers when used intravenously. Only distilled water should be used for such purposes. This is equally true of culture media the hydrogen ion concentration of which needs to be very accurately calibrated.

It is a fact that "anaesthesia" was used by the surgeons long before ether and chloroform ever came to be. As early as the third century there are records of the Chinese surgeon, Hoa-tho, using a preparation of hemp (cannabis) to render his patients unconscious during an operation, and for centuries another form of pain reliever was in use known as "Spongia somnifera" or "Soporific Sponge." Theodoric, about the tenth century, described the making of this, calling it a "flavor" from opium, mulberry, hyoscyamus, hemlock, mandragora, and other plants. This liquid was applied on a sponge to the nostrils of the patient to produce insensibility to pain and one may well believe that this combination, not only by inhalation but also by absorption through the mucous membrane of the nose, could induce effective narcosis. It is even thought that perhaps the sponge, dipped into "vinegar" and offered to Christ on the cross, may have been of the nature of the "soporific sponge" and intended to produce a stupor and insensibility to pain.

"Countless as the hairs on Hiram's head," is no longer the truth, even in New England where the phrase is oft-spoken. For it is now known that although the number of hairs on the healthy scalp varies with age and oddly enough with the color of the hair; 100,000 to 200,000 seems to be a fair range. According to one compiler of such statistics a flaxen-haired beauty disports the greatest number, from 140,000 to 180,000; the black-haired belle a few less 100,000 to 120,000, and the coarser haired red head even less than 50,000.

The scalp area of normal adults varies from about 100 to 140 square inches, and will produce in the Scriptural tenure of earthly

office, namely, three score years and ten, about 240 ounces (15 pounds) of hair, which uncut, unscissored and unsinged, might, have reached a length of nearly 35 feet. On a graded basis these scalp statistics show that a square inch of cranial coverage will annually produce a crop of hair amounting to somewhere between 1/100th to 4/100ths of an ounce. Such is the arithmetic of trichology.

TRACES FROM TONS. F. J. METZGAR. *Ind. Eng. Chem.*, 27, 112-6 (Jan., 1935).—In his address on accepting the Chemical Industry Medal for 1934, the author points out that the recovery of rare gases of the atmosphere has been accomplished with greater accuracy in the plant than by the refined methods of research; when in the recovery of Xe and Kr, the yield was apparently over 100 per cent. on the basis of previous determinations, showing that the amount was greater than had previously been estimated. The liquefaction and separation is now so well controlled that oxygen is 99.5 per cent. and nitrogen about 99.8 per cent. pure. The amount of Ne in air is 1 lb. in 44 tons, He 1 lb. in 725 tons, Kr 1 lb. in 173 tons, and Xe 1 lb. in 1208 tons. Ne and He have low boiling points and remain uncondensed, concentrating to about 45 per cent. Ne and 15 per cent. He. Separation is made by absorption in activated charcoal. Kr and Xe condense in the oxygen portion and are separated by fractionation. Kr was marketed for a time as 98.5 per cent. pure, until a redetermination of the constants showed that it had really been 100 per cent.

Argon has its greatest use in incandescent filament lamps, replacing nitrogen in whole or in part. Tens of thousands of cu. ft. are consumed per month. It is estimated that the use of argon in place of nitrogen has reduced the annual electric light bill from \$745,000,000 to \$620,000,000. Neon with its high conductivity and high light-emissive power is used in display signs. Helium is used for production of yellow and white light. Kr and Xe are used for similar purposes, since the addition of small amounts produces decided changes. These may replace A, since when used in lamps the efficiency is increased one-third. This would require a tremendous increase in the amount of air handled, since A is present to the extent of almost 1 per cent. (D. C. L., *Jour. Chem. Educ.*)